

CLAIMS

1 1. A method for generating a work flow schedule, the schedule including a
2 plurality of tasks, each task requiring at least one resource, each resource having a
3 limitation and a cost, the method comprising:
4 creating, using a makespan minimizer, an initial schedule of tasks, the schedule
5 not violative of the resource limits and task constraints associated with the
6 tasks in the schedule; and
7 lowering the limitations of each resource and using the makespan minimizer to
8 find a new valid schedule for the new level of resources.

1 2. The method of claim 1, wherein each resource limitation includes an upper
2 bound for an associated resource, and the step of lowering the limitations of each
3 resource further comprises:
4 lowering the resource to a level where, while the remaining resources are at their
5 upper bounds, the makespan minimizer is not able to return a valid schedule;
6 and
7 incrementing the lowered resource level until the makespan minimizer is able to
8 return a valid schedule.

1 3. The method of claim 2, further comprising:
2 selecting a resource and lowering its level from its original level by a constant
3 amount;
4 determining whether the makespan minimizer can return a valid schedule using
5 the lowered value of the resource; and
6 responsive to the makespan minimizer not returning a valid schedule using the
7 lowered value of the resource, returning the resource to its original level.

1 4. A method for generating a work flow schedule, the schedule including a
2 plurality of tasks, each task requiring at least one resource, each resource having a
3 limitation and a cost, the method comprising:

4 incrementally generating an initial schedule by calling, for each task, a
5 manpower planner to determine an at least partially optimized time for the
6 task to be executed, such that the execution of the task at the optimized time
7 results in the lowest total cost for the incremental schedule; and
8 incrementally improving the initial schedule by calling, for each task, the
9 manpower planner, and determining a new at least partially optimized time
10 to execute the task, such that the execution of the task at the new optimized
11 time minimizes the total cost of the improved schedule.

1 5. A method for determining an optimal resource acquisition and release profile
2 for a given schedule, comprising:

3 receiving a schedule specifying resource requirements at a plurality of time
4 points, each resource having at least one associated cost;

5 for each resource required by the schedule:

6 for each time point, using a dynamic programming procedure to
7 determine an optimal cumulative cost from the beginning of the
8 schedule to the time point, for a plurality of resource levels;
9 determining the optimal cost of the schedule by selecting, from the
10 group of optimal cumulative costs from the beginning of the
11 schedule to a last time point, the optimal cumulative cost having
12 the lowest cost; and

13 determining based on the optimal cost of the schedule, an optimal resource
14 acquisition and release profile.

1 6. A system for generating a work flow schedule, the schedule including a
2 plurality of tasks, each task requiring at least one resource, each resource having a
3 limitation and a cost, the system comprising:

4 a makespan-based load leveler, for minimizing schedule makespan subject to
5 resource limits, lowering the resource limits, and repeating the makespan
6 minimization in order to create a flatter schedule.

1 7. The system of claim 6, further comprising:

2 a manpower planner, communicatively coupled to the cost minimizer, for
3 determining based on task and resource information, including valid task
4 start times and resource costs, a plurality of optimal resource levels for a
5 schedule.

1 8. A system for generating a work flow schedule, the schedule including a
2 plurality of tasks, each task requiring at least one resource, each resource having a
3 limitation and a cost, the system comprising:

4 a cost minimizer for generating an initial valid work flow schedule according to
5 which each task is executed without exceeding any limitations of any of the
6 resources required by the task, and incrementally improving the schedule
7 such that the total cost of the schedule is reduced with each incremental
8 improvement; and

9 a manpower planner, communicatively coupled to the cost minimizer, for
10 determining based on task and resource information, including valid task
11 start times and resource costs, a plurality of optimal resource levels for a
12 schedule.

1 9. A system for generating a work flow schedule, the schedule including a
2 plurality of tasks, each task requiring at least one resource, each resource having a
3 limitation and a cost, the system comprising:

4 first incrementing means for incrementally generating an initial schedule by
5 calling, for each task, a manpower planner to determine an optimal time for
6 the task to be executed, such that the execution of the task at the optimal time
7 results in the lowest total cost for the incremental schedule; and
8 second incrementing means, communicatively coupled to the first incrementing
9 means, for incrementally improving the initial schedule by calling, for each
10 task, the manpower planner, and determining a new optimal time to execute
11 the task, such that the new optimal time is the time that minimizes the total
12 cost of the improved schedule.

1 10. A system for generating a work flow schedule, the schedule including a
2 plurality of tasks, each task requiring at least one resource, each resource having a
3 limitation and a cost, the system comprising:

4 creating means for creating, using a makespan minimizer, an initial schedule of
5 tasks, the schedule not violative of the resource limits and task constraints
6 associated with the tasks in the schedule; and

7 lowering means, coupled to the creating means, for lowering the limitations of
8 each resource and using the makespan minimizer to find a new valid schedule for the
9 new level of resources.